Original Article

Assessment of Avoidable Blindness Using the Rapid Assessment of Avoidable Blindness Methodology

Guruprasad S Bettadapura, Krishnamurthy Donthi, Narendra P Datti, Bommanahalli G Ranganath[1], Shamanna B Ramaswamy[2], Tejal S Jayaram

Departments of Ophthalmology, [1]Community Medicine, Sri Devaraj Urs Medical College, Sri Devaraj Urs Academy of Higher Education and Research, Tamaka, Kolar, Karnataka, [2]Senior Public Health Specialist, Indian Institute of Public Health, Hyderabad, Andhra Pradesh, India

Abstract

Background: More than 90% of visual impairment can either be treated or avoided. Rapid Assessment of Avoidable Blindness methodology provides valid estimates in short time to assess magnitude and causes of blindness. **Aims**: To estimate the prevalence and causes of blindness in persons above 50 years in Kolar, South India, using the above methodology. **Materials and Methods:** Sixty one clusters of 50 people aged above 50 years were selected by probability-proportionate to size sampling. Participants were evaluated using a standardized survey form. Persons with vision <20/60 were dilated and examined by an ophthalmologist. **Results:** Of the 3050 people listed 2907 were examined (95.3%). Prevalence of bilateral blindness in persons was 3.9%; severe visual impairment 3.5%, and visual impairment 10.4%. Untreated cataract was the leading cause of blindness (74.6%) and severe visual impairment (73.3%). Avoidable causes of blindness accounted for 91.2% of all blindness and 95.0% of severe visual impairment. 'Waiting for maturity' and 'No one to accompany' were the most common barriers to uptake of cataract surgery. **Conclusion:** Untreated cataract continues to be the leading cause of avoidable blindness. Modified strategies need to be implemented to tackle the burden of cataract blindness.

Keywords: Avoidable blindness, cataract, eye care services, rapid assessment, vision 2020

Address for correspondence: Dr. Guruprasad S Bettadapura, Department of Ophthalmology, Sri Devaraj Urs Medical College, Tamaka, Kolar, Karnataka, India. E-mail: prasadbsg@yahoo.com

Introduction

Global estimates suggest that there are approximately 39 million people in the world who are blind and 246 million have low vision. Over 90% of those visually impaired live in developing countries. Furthermore, 80% of all visual impairment can be avoided or cured.[1] Vision 2020 is a joint initiative by the World Health Organization (WHO) and the International Agency for the Prevention of Blindness, that aims to eliminate avoidable blindness by the year 2020. The vision 2020 strategy depends on the development of district level plans for the prevention of avoidable blindness.[2-6]

Access this article online

Quick Response Code:

Website: www.najms.org

DOI: 10.4103/1947-2714.100982

India was the first country in the world to initiate a public funded program for the prevention of blindness as a national priority health problem.[7] Population-based surveys have been the main stay of information regarding the effective implementation and monitoring of such eye care programs. Large scale surveys are expensive and time consuming.[8]

Rapid assessment of avoidable blindness (RAAB) survey is cheap and easy means of getting population-based data on prevalence and causes of blindness in people aged more than 50 years. RAAB also has the other utility of monitoring programs at the unit/district level.[9-11]

Kolar district in south Karnataka, India, has an estimated population of around 1.5 million, 51% of the population being males and 29% being over 50 years. The aim of the study was to conduct a RAAB study in persons aged more than 50 years in Kolar district in order to estimate the prevalence and causes of blindness. This was also to help the ophthalmology and community medicine

departments of the medical institution to develop student capacity as well as expose them to scientific survey methods of generating evidence for planning of eye care services.

Materials and Methods

The survey was carried out by a team consisting of trained personnel from the Departments of Ophthalmology and Community Medicine, Sri Devaraj Urs Medical College, Kolar, Karnataka, India. The survey was carried out between March and June 2011 (4 months), in accordance with the Helsinki Declaration. Ethical approval was given by the Institutional Ethics Committee. Permission was also obtained from the District Health Officer, Kolar. Written informed consent was obtained from all study participants, after explaining the purpose of the study in their local language.

Sample size calculation

Sample size was determined using a prevalence estimate of 4% for blindness (WHO definition of presenting vision < 20/400 in better eye) among those aged over 50 years. The prevalence estimate was assumed to be around 4% considering the recent RAAB survey conducted across India which gave prevalence of blindness using the same definition to be around 3.6%.[7] Using 95% confidence interval, 22.5% precision, design effect of 1.5 and 10% nonresponse rate, sample size was calculated to be 3017, which would require 61 clusters of 50 people aged over 50 years.

Sampling frame

Using the population data from the last census (2001) and the growth rate for 9 years, the population was estimated for end of 2010 and used as a sampling frame. A list of wards and villages in urban and rural areas was prepared taluk (revenue division) wise. In each, the population size of people aged over 50 years was listed. Clusters were then selected using probability proportionate to size method. Households within each cluster were selected by compact segment sampling. A map of the selected cluster was drawn and divided into equal segments that would give 'x' number of people aged over 50 years. Segments were numbered and one segment was chosen by draw of lots. To be eligible for inclusion an individual had to reside in that household for at least the previous 6 months.

In each cluster, the survey team visited each household accompanied by local health worker to facilitate compliance. The people in the selected cluster were briefed about the survey 2–3 days in advance by the local health worker along with the Public Relations Officer of the team. Informed consent was taken from each eligible participant. All the examinations were conducted in the respective household. If an eligible person was not available during the survey, at least two more attempts were made to assess information. If after repeated visits, examination could not be done, information of his visual status was obtained from his relatives or neighbors.

Ophthalmic examination

Standard RAAB Protocol was used for gathering information and for eye examination.[12] A survey form comprising seven sections was filled for each participant. The form consisted of general information; vision and pin hole examination; lens status; principal cause of visual impairment; history if not examined; and barriers to uptake of cataract surgery and details of cataract surgery if operated. Visual acuity (VA) was measured using a tumbling Snellen-E chart using optotype size 20/60 on one side and 20/200 on the other. All measurements were taken in full daylight with available correction. If visual acuity was less than 20/60 in either eye, pin hole vision was tested. Ocular examination was performed by an ophthalmologist on each participant in their respective households. Lens status was assessed by a bright torchlight. If presenting vision was < 20/60, then pupil was dilated and ophthalmoscopy done to assess the cause of blindness.

Training

Two teams received 4 days of training from a certified RAAB trainer. A pilot study was conducted at the end of the training. The interobserver agreement between the two teams was good as observed by the kappa value (>0.60).

Statistical analysis

Double data entry and analysis was done using the RAAB software program version 4.02. To check for errors made during data entry of the survey record forms, the data are entered twice by different data entry clerks in two separate databases and then compared. Any variations are indicated and corrected at the data entry level itself.

Results

A total of 3050 persons aged over 50 years were included in the study and 2907 (95.3%) of them were examined. Of them 1360 (47%) were males and 1547 (53%) were females. The sampled population was relatively representative of the district population in terms of age and sex distribution. The overall unadjusted prevalence of blindness from all causes in persons aged over 50 years was 3.9% (95% CI 2.7–5.1).

Table 1 shows the data regarding prevalence of blindness (VA < 20/400 in better eye with available correction); severe visual impairment (VA < 20/200– 20/400 in

better eye with available correction) and moderate visual impairment in persons (VA < 20/60– 20/200 in better eye with available correction). The age and sex adjusted prevalence of blindness, severe visual impairment, and moderate visual impairment was 3.4%, 3.1%, and 9.7%, respectively.

Untreated cataract was the primary cause of bilateral blindness (75%) and severe visual impairment (73%). Posterior segment causes were the second most important cause of blindness (8.8%). Refractive errors Were the most common cause of moderate visual impairment (56%) and second most common cause of severe visual impairment (11%). Avoidable causes accounted for 91% of all cases of blindness and 95% of cases of severe visual impairment [Table 2].

The main barriers to uptake of cataract surgery were 'No one to accompany' (27%); 'waiting for maturity' (27%); 'do not know how to get surgery done' (10%); and 'old age no need' (7%).

The Cataract Surgical Coverage (CSC) in persons with VA < 20/400 was high, with 82% of those requiring surgery having received the same. For people with VA < 20/200 and VA < 20/60, 72% and 64%, respectively of those needing surgery had received it [Table 3].

Of the 707 eyes, which had received surgery, 641 (90.7%) had an intra-ocular lens (IOL) implantated. Among the patients with IOL, 72.7% had VA of 20/60 or more with available correction [Table 4]. In patients operated less than 5 years back, 86% of patients with IOL had best corrected VA of more than or equal to 20/60, when compared with 79% in patients with IOL operated more than 5 years back. Around 85% of patients were satisfied with the results of cataract surgery. Ocular comorbidities, operative complications and long-term complications were the principal reasons for poor outcome in eyes operated less than 3 years back.

Low vision (persons with VA <20/60 in better eye with correction and not due to cataract, refractive error, or uncorrected aphakia) was seen in 46 persons (1.6%).

Discussion

In India, eye care planning and monitoring under the National Program for Control of Blindness has been guided by population-based surveys. Rapid assessment techniques, which provide reliable estimates have been used for the past 16 years and have been the basis for district level programming.[7,13,14]

The prevalence of blindness (VA < 20/400) was 3.9% in our study, which is almost similar to the RAAB study conducted across various states in India, which gave a prevalence of 3.6%.[7] The RAAB India study which covered Gulbarga district in Karnataka, gave a prevalence of 4.3% for that district.[7] The prevalence of blindness in our study is on the higher side when compared with other studies from Kenya,[8] Bangladesh,[5] China,[10] Palestinian territories[6] and Malawi[9] where blindness prevalence ranged from 2.0% to 3.7%. Consequently, even though there has been a sharp increase in outreach programs and service delivery, this has been offset by the increasing elderly population as a result of increased life expectancy.[15]

In our study, almost 91% of blindness was avoidable. Untreated cataract still continues to be the major cause of blindness and severe visual impairment. Refractive errors and uncorrected aphakia are the other leading avoidable causes. Despite the increased CSC, there are an estimated 4700 people [Table 5] who are having bilateral cataract in Kolar district, extrapolating the survey findings. This cataract burden can only be reduced by proper taluk wise segmentation of the cataract blind and targeting the community outreach programs toward these areas. Spectacle provision to the needy at a peripheral level by means of mobile refraction units and spectacle dispensing outfits further enhance the coverage of other avoidable causes of blindness.

Modified strategies in the form of extensive health awareness and health education campaigns through a decentralized approach involving all major health care providers at the grass root level, down to the remote rural level could be one of the positive steps in reducing this cataract burden.

One of the main barriers to the uptake of cataract surgery was 'waiting for maturity'. This indirectly indicates that patients have been told to wait and sent back, which is an indicator of service delivery deficiency. Such people

Table 1: Sample prevalence of blindness, severe visual impairment and moderate visual impairment – all causes

Parameter	Males			Females			Total		
	N	%	95% CI	N	%	95% CI	N	%	95% CI
Blindness	39	2.9	1.68–4.06	75	4.9	3.29–6.41	114	3.9	2.74–5.10
Severe visual impairment	39	2.9	1.78–3.96	62	4	2.84–5.17	101	3.5	2.49–4.46
Moderate visual impairment	142	10.4	8.1–12.78	161	10.4	8.52–12.29	303	10.4	8.77–12.08

once turned back are unlikely to return back because of reasons such as lack of funds for conveyance to the hospital, loss of daily wages during the visit to the hospital, and relative lack of knowledge about when to return. Approximately 12% of operated patients had best corrected VA of less than 20/200. Thus not only increasing the outreach programs but also concentrating on proper case selection, good surgical techniques, proper follow-up care and spectacle provision will definitely reduce the barriers and improve the outcome after cataract surgery.

Gender wise, females had higher prevalence of blindness in our study. This could be due to the fact that increased percentage of males seeks eye care services as reflected in the increased CSC among males. Also females are less likely to report a need for sight than males.[16–22]

The strengths of our study was ready availability of taluk wise population data and the survey teams being trained by a certified RAAB trainer. Another added advantage was the high agreement between the survey teams. The survey had quality control visits in between by the training faculty.

Conclusion

Our survey found untreated cataract to be the most common avoidable cause of blindness. Even though, there is a decline in prevalence of blindness, modified strategies need to be implemented to tackle the burden of untreated cataract. RAAB done at regular intervals is an effective tool to quantify the problem of blindness and monitor the implementation of eye care programs.

Acknowledgements

Dr. S. Chandrashekar Shetty, Vice-Chancellor SDUAHER and Dr. G.V.S. Murthy, Director Indian Institute of Public

Table 2: Causes of blindness (VA < 20/400), severe visual impairment (VA 20/200–20/400) and moderate visual impairment (VA 20/60–20/200)

Cause	Bil. Blindness		Bil. SVI		Bil. MVI	
	N	%	*N*	%	*N*	%
Cataract untreated	85	74.6	74	73.3	107	35.3
Refractive error	3	2.6	11	10.9	170	56.1
Aphakia uncorrected	6	5.3	3	3	1	0.3
Surgical complications	4	3.5	7	6.9	18	5.9
Phthisis	3	2.6	0	0	0	0
Other corneal scar	3	2.6	1	1	1	0.3
Posterior segment abn.	10	8.8	5	5	6	2
Total	114	100	101	100	303	100
Total avoidable	104	91.2	96	95	297	98

Table 5: Age and sex adjusted prevalence

Parameter	Gender	*N*	%	CI
Bilateral blind	Males	2,571	2.4	1.15–3.55
	Females	4,798	4.3	2.76–5.88
	Total	7,369	3.4	2.17–4.53
Severe visual impairment	Males	2,768	2.5	1.45–3.63
	Females	4,138	3.7	2.56–4.88
	Total	6,906	3.1	2.15–4.13
Moderate visual impairment	Males	10,189	9.3	7.0–11.68
	Females	11,135	10	8.13–11.91
	Total	21,323	9.7	8.02–11.34
Bilateral cataract and blindness	Males	1,613	1.5	0.68–2.28
	Females	3,163	2.9	1.61–4.09
	Total	4,776	2.2	1.31–3.03
Bilateral cataract and severe visual impairment	Males	1,701	1.6	1.0–2.12
	Females	2,791	2.5	1.68–3.34
	Total	4,492	2	1.46–2.62
Bilateral cataract and moderate visual impairment	Males	2,597	2.4	1.52–3.24
	Females	3,013	2.7	1.91–3.51
	Total	5,610	2.6	1.9–3.2

Table 3: Cataract surgical coverage by persons and eyes sex wise

Gender	VA < 20/400		VA < 20/200		VA < 20/60	
	Persons-%	Eyes-%	Persons-%	Eyes-%	Persons-%	Eyes-%
Males	84.6	72.1	75.7	60	65.6	50
Females	79.7	67.8	69.8	57.3	63.1	48.6
Total	81.7	69.6	72.2	58.4	64.1	49.2

Table 4: Postoperative visual acuity with available correction

Visual acuity	IOL		Non-IOL		Total	
	Eyes	%	Eyes	%	Eyes	%
Can see 20/60	466	72.7	7	10.6	473	66.9
Cannot see 20/60—can see 20/200	105	16.4	1	1.5	106	15
Cannot see 20/200	70	10.9	58	87.9	128	18.1

Health, Hyderabad for their constant support and guidance of this project. All the Residents, Optometrist and PROs of Department of Ophthalmology and Community Medicine, SDUMC, Kolar.

References

1. Global blindness and Visual impairment. World Health Organisation – Media centre October 2011. (Accessed April 29, 2012, at http://www.who.int/entity/mediacentre/factsheets/fs282/en/index).
2. Vision 2020: The right to sight. (Accessed March 15, 2012, at http://www.vision2020.org/main.cfm).
3. Resnikoff S, Kocur I, Etya'ale DE, Ukety TO. Vision 2020 – the right to sight. Ann Trop Med Parasitol 2008;102 suppl 1:3-5.
4. Foster A, Resnikoff S. The impact of vision 2020 on global blindness. Eye (Lond) 2005;19:1133-5.
5. Wadud Z, Kuper H, Polack S, Lindfield R, Akm MR, Choudhury KA, *et al*. Rapid assessment of avoidable blindness and needs assessment of cataract surgical services in Satkhira District, Bangladesh. Br J Ophthalmol 2006;90:1225-9.
6. Chiang F, Kuper H, Lindfield R, Keenan T, Seyam N, Magauran D, *et al*. Rapid assessment of avoidable blindness in the occupied Palestinian territories. PLoS One 2010;5:e11854.
7. Neena J, Rachel J, Praveen V, Murthy GV; Rapid Assessment of Avoidable Blindness India study Group. Rapid assessment of avoidable blindness in India. PLoS One 2008;3:e2867.
8. Mathenge W, Kuper H, Limburg H, Polack S, Onyango O, Nyaga G, *et al*. Rapid assessment of avoidable blindness in Nakuru district, Kenya. Ophthalmology 2007;114:599-605.
9. Kalua K, Lindfield R, Mtupanyama M, Mtumodzi D, Msiska V. Findings from a rapid assessment of avoidable blindness in southern Malawi. PLoS One 2011;6:e19226.
10. Wu M, Yip JL, Kuper H. Rapid assessment of avoidable blindness in Kunming, China. Ophthalmology 2008;115:969-74.
11. Dineen B, Foster A, Faal H. A proposed rapid methodology to assess the prevalence and causes of blindness and visual impairment. Ophthalmic Epidemiol 2006;13:31-4.
12. Rapid assessment of avoidable blindness survey methodology. (Accessed April 4, 2012, at https://www.iceh.org.uk/display/WEB/Rapid+assessment+of+avoidable+blindness+survey+methodology).
13. Bachani D, Murthy GV, Gupta KS. Rapid assessment of cataract blindness in India. Indian J Public Health 2000;44:82-9.
14. National Program for Control of Blindness. Rapid Assessment of Avoidable Blindness-INDIA. (Accessed January 4, 2012, at: http://www.vision2020india.org/downloads/RAAB_Report_2007.pdf).
15. Prakash IJ. Aging, disability and disabled older people in India. J Aging Soc Policy 2003;15:85-108.
16. Courtright P, Lewallen S. Improving gender equity in eye care: Advocating for the needs of women. Community Eye Health 2007;20:68-9.
17. Lewallen S, Mousa A, Bassett K, Courtright P. Cataract surgical coverage remains lower in women. Br J Ophthalmol 2009;93:295-8.
18. Courtright P, Metcalfe N, Hoechsmann A, Chirambo M, Lewallen S, Barrows J, *et al*. Cataract surgical coverage and outcome of cataract surgery in a rural district in Malawi. Can J Ophthalmol 2004;39:25-30.
19. Lewallen S, Courtright P. Increasing uptake of eye services by women. Community Eye Health 2006;19:59-60.
20. Courtright P, Lewallen S. Why are we addressing gender issues in vision loss? Community Eye Health 2009;22:17-9.
21. Lewallen S, Courtright P. Gender and use of cataract surgical services in developing countries. Bull World Health Organ 2002;80:300-3.
22. Geneau R, Lewallen S, Bronsard A, Paul I, Courtright P. The social and family dymanics behind the uptake of cataract surgery: Findings from Kilimanjaro region, Tanzania. Br J Ophthalmol 2005;89:1399-402.

How to cite this article: Bettadapura GS, Donthi K, Datti NP, Ranganath BG, Ramaswamy SB, Jayaram TS. Assessment of avoidable blindness using the rapid assessment of avoidable blindness methodology. North Am J Med Sci 2012;4:389-93.

Source of Support: Funding from Sri Devaraj Urs Academy of Higher Education and Research (SDUAHER), Kolar. **Conflict of Interest:** None declared.